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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/023,264	12/18/2001	Nils Peter Nordqvist	22645-7202	5504

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David G. Beck
McCutchen, Doyle, Brown & Enersen, LLP
28th Floor
Three Embarcadero Center
San Francisco, CA 94111

EXAMINER	
ENSEY, BRIAN	
ART UNIT	**PAPER NUMBER**
2643	6

DATE MAILED: 11/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/023,264	NORDQVIST ET AL.	
	Examiner	Art Unit	
	Brian Ensey	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5,10,14,15,17,22-24 and 26* is/are rejected.

7)☒ Claim(s) *3,4,6-9,11-13,16,18-21 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5,6 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claim 25 is objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternate only and cannot depend from any other multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claim has not been further treated on the merits.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 2, 5, 10, 14, 15, 22-24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allegro et al, U.S. Patent Application Publication US2002/0037087 A1 in view of Rahim, European Patent Application EP 0,881,625 A2.

Regarding claim 1, Allegro discloses a hearing aid prosthesis (1) comprising: a microphone (2) adapted to generate an input signal in response to receiving an acoustic signal from a listening environment, an output transducer (6) for converting a processed output signal into an electrical or an acoustic signal, processing means (4,5,7) adapted to process the input signal in accordance with a predetermined signal processing algorithm and related algorithm parameters to generate the processed output signal, a memory area (8) storing values of the related algorithm parameters for the predetermined signal processing algorithm, and processing the characteristics of the input signal with at least one discrete Hidden Markov Model, $\lambda^{source} = \{A^{source}, B^{source}, \alpha_0^{source}\}$, associated with a predetermined sound source to determine element value(s) of a classification vector indicating a probability of the predetermined sound source being active in the listening environment, control one or several values of the related algorithm parameters in dependence of the element value(s) of the classification vector; thereby adapting characteristics of the predetermined signal processing algorithm to the current listening environment; wherein; A_{source} = A state transition probability matrix; B_{source} = An observation symbol probability distribution matrix for an input observation O(t) for each state of the at least one Hidden Markov Model (HMM); α_0^{source} = An initial state probability distribution vector (See Fig. 1 and paragraphs 0010-0027). Allegro does not expressly disclose segmenting the input signal into consecutive signal frames of time duration, T_{frame}, and generate respective feature vectors, O(t), representing predetermined signal features of the consecutive frames, compare each of the feature vectors, O(t), with a feature vector set to determine, for substantially each feature vector, an associated symbol value so as to generate an observation sequence of symbol values associated with the consecutive signal frames. However, Allegro teaches extraction of characteristic features from an acoustic signal during an extraction phase (See paragraph 0019). Further, Rahim teaches a speech recognition system using a feature extractor to generate a set of

feature vectors and a classification processor to generate a set of recognition models to be processed by one or more HMMs (See col. 6, line 26 to col. 7, line 35). It would have been obvious to one of ordinary skill in the art at the time of the invention that input segmentation and vector generation is an integral part of processing an input signal using a Hidden Markov Model for determining the real time status of the acoustic scene.

Regarding claim 2, Allegro further discloses the processing means are adapted to process the input vectors with a plurality of discrete Hidden Markov Models associated with respective predetermined sound sources to determine the element values of the classification vector indicating a probability of each predetermined sound source (See paragraphs 23-26). Allegro does not expressly disclose the creation of symbol values for associated feature vectors. However, Rahim teaches a speech recognition system using a feature extractor to generate a set of feature vectors and a classification processor to generate a set of recognition models to be processed by one or more HMMs (See col. 6, line 26 to col. 7, line 35). It would have been obvious to one of ordinary skill in the art at the time of the invention that input segmentation and vector generation is an integral part of processing an input signal using a Hidden Markov Model for determining the real time status of the acoustic scene.

Regarding claim 5, Allegro further discloses the feature vector set has been determined in an off-line training procedure which utilized real-life sound source recordings and stored in non-volatile memory locations of the hearing instrument (See paragraphs 16, 25 and 26).

Regarding claim 10, Allegro discloses a hearing aid prosthesis (1) comprising: a microphone (2) adapted to generate an input signal in response to receiving an acoustic signal from a listening environment, an output transducer (6) for converting a processed output signal into an electrical or an acoustic signal, processing means (4,5,7)adapted to process the input

signal in accordance with a predetermined signal processing algorithm and related algorithm parameters to generate the processed output signal, a memory area (8) storing values of the related algorithm parameters for the predetermined signal processing algorithm, and the processing means using a combination of HMMs and classifiers for multistage recognition processes to control one or several values of the related algorithm parameters in dependence of the element value(s) of the classification vector; thereby adapting characteristics of the predetermined signal processing algorithm to the current listening environment (See Fig. 1 and paragraphs 0010-0027). Allegro does not expressly disclose the processing means being further adapted to: segment the input signal into consecutive signal frames of time duration, T_{frame}, and generate respective feature vectors, O(t), representing predetermined signal features of the consecutive frames, process the feature vectors with one or a plurality of Hidden Markov Models operating on a first time scale and associated with respective a predetermined sound source to determine element value(s) of a classification vector indicating a probability of the predetermined sound source being active in the listening environment, process the first classification vector with a Hidden Markov Model operating at a second time scale and associated with one or more predetermined sound sources to determine element value(s) of a classification vector, However, Allegro teaches extraction of characteristic features from an acoustic signal during an extraction phase. Further, Rahim teaches a speech recognition system using a feature extractor to generate a set of feature vectors and a classification processor to generate a set of recognition models to be processed by one or more HMMs (See col. 6, line 26 to col. 7, line 35). It would have been obvious to one of ordinary skill in the art at the time of the invention that input segmentation and vector generation is an integral part of processing an input signal using multiple Hidden Markov Models for determining the real time status of the acoustic scene.

Regarding claim 14, Allegro discloses a prosthesis as claimed. Allegro does not expressly disclose at least one predetermined HMM or each of the plurality of predetermined HMMs comprises between 2 to 10 states. However, Rahim teaches a set of HMMs each having 3 to 4 states (See col. 14, lines 4-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to limit the number of states to less than 10 to allow faster processing and reduced memory requirements.

Regarding claim 15, Allegro discloses a hearing aid prosthesis (1) comprising: a microphone (2) adapted to generate an input signal in response to receiving an acoustic signal from a listening environment, an output transducer (6) for converting a processed output signal into an electrical or an acoustic signal, processing means (4,5,7) adapted to process the input signal in accordance with at least two predetermined signal processing algorithm and respective sets of algorithm parameters to generate the processed output signal, a memory area (8) storing values of the related algorithm parameters for the at least two predetermined signal processing algorithms, and processing the characteristics of the input signal with at least one discrete Hidden Markov Model, $\lambda^{source} = \{A^{source}, B^{source}, \alpha_0^{source}\}$, associated with a predetermined sound source to determine element value(s) of a classification vector indicating a probability of the predetermined sound source being active in the listening environment, control a transition between the at least two predetermined signal processing algorithms in dependence of the element values of the classification vector; wherein; A_{source} = A state transition probability matrix; B_{source} = An observation symbol probability distribution matrix for an input observation O(t) for each state of the at least one Hidden Markov Model (HMM); α_0^{source} = An initial state probability distribution vector (See Fig. 1 and paragraphs 0010-0027). Allegro does not expressly disclose segmenting the input signal into consecutive signal frames of time duration, T_{frame}, and generate respective feature vectors, O(t), representing predetermined signal features of

the consecutive frames, compare each of the feature vectors, O(t), with a feature vector set to determine, for substantially each feature vector, an associated symbol value so as to generate an observation sequence of symbol values associated with the consecutive signal frames. However, Allegro teaches extraction of characteristic features from an acoustic signal during an extraction phase (See paragraph 0019). Further, Rahim teaches a speech recognition system using a feature extractor to generate a set of feature vectors and a classification processor to generate a set of recognition models to be processed by one or more HMMs (See col. 6, line 26 to col. 7, line 35). It would have been obvious to one of ordinary skill in the art at the time of the invention that input segmentation and vector generation is an integral part of processing an input signal using a Hidden Markov Model for determining the real time status of the acoustic scene.

Regarding claim 17, Allegro discloses a prosthesis as claimed. Allegro does not expressly disclose a predetermined sound is a natural or synthetic sound source selected from a group consisting of: {speech, telephone speech, traffic noise, multi-talker or babble noise, subway noise, transient noise, wind noise}. However, Rahim teaches a predetermined source including various forms of speech (See Col. 13, lines 19-58). It would have been obvious to one of ordinary skill in the art at the time of the invention that the predetermined source is speech since the device itself is a hearing device for providing clear sound inputs.

Regarding claim 22, Allegro discloses a hearing aid prosthesis (1) comprising: a microphone (2) adapted to generate an input signal in response to receiving an acoustic signal from a listening environment, an output transducer (6) for converting a processed output signal into an electrical or an acoustic signal, processing means (4,5,7) adapted to process the input signal in accordance with a predetermined signal processing algorithm and related algorithm parameters to generate the processed output signal, a memory area (8) storing values of the related algorithm parameters for the predetermined signal processing algorithm, the processing

means being further adapted to: process the feature vectors with a set of Hidden Markov Models and a make the hearing prosthesis capable of voice activation of user input devices(See Fig. 1 and paragraphs 0010-0027). Allegro does not expressly disclose segmenting the input signal into consecutive signal frames of time duration, T_{frame}, and generate respective feature vectors, O(t), representing predetermined signal features of the consecutive, or modeling respective isolated words or commands to determine element values of a classification vector indicating a probability of an isolated word or command being spoken. However, Allegro teaches extraction of characteristic features from an acoustic signal during an extraction phase (See paragraph 0019). Further, Rahim teaches a speech recognition system using a feature extractor to generate a set of feature vectors and a classification processor to generate a set of recognition models to be processed by one or more HMMs and modeling respective isolated words or commands to determine element values of a classification vector indicating a probability of an isolated word or command being spoken (See col. 6, line 26 to col. 7, line 35). It would have been obvious to one of ordinary skill in the art at the time of the invention that input segmentation and vector generation is an integral part of processing an input signal using a Hidden Markov Model for determining the real time status of the acoustic scene and using specific isolated words or commands for voice activation.

Regarding claim 23, Allegro further discloses the processing means are adapted to recognize voice commands from the user to control a voice-activated user input device (See paragraph 0027). Allegro does not expressly disclose controlling one or several functions of the hearing aid. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that the voice activation capabilities of the device be used to control the hearing prosthesis for ease of use by the wearer.

Regarding claim 24, Allegro discloses a prosthesis as claimed. Allegro does not expressly disclose the HMMs used are left-right HMMs. However, the use of left-right HMMs is well known in the art and Rahim teaches a set of left to right HMMs (See col. 14, lines 4-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to use left-right HMMs to more easily match the normal left-right pattern of human speech.

Regarding claim 26, Allegro discloses a hearing aid prosthesis as claimed above. Allegro does not expressly disclose the processing means comprises a software programmable processor. However, Rahim teaches a processing means comprising a software programmable processor (See Col. 5, lines 22-44). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a software programmable processor to save space and provided a smaller unit for a less visible prosthesis.

Allowable Subject Matter

4. Claims 3,4,6-9, 11-13, 16, and 18-21 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Ensey whose telephone number is 703-305-7363. The examiner can normally be reached on Mon-Fri: 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Kuntz can be reached on 703-305-4708. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Or faxed to:

(703) 872-9306, for formal communications intended for entry and for informal or draft communications, please label "PROPOSED" or "DRAFT".

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

BKE
October 29,2003

CURTIS KUNTZ
Y PATENT EXAMINER
GY CENTER 2600